

REMARKS

It is noted that claims 10, 11, 17 and 18 would be allowable if put in independent form. Applicant's claims 10, 11, and 17 have been placed in independent form and are therefore deemed allowable. Claim 18 dependent on claim 17 is deemed allowable for at least the same reasons as claim 17. The other claims are deemed allowable for the reasons discussed below.

Claims 3, 5, 12-16, and 19 are rejected under 35 U.S.C. 102 (e) as being anticipated by Neumeyer et al. (U.S. patent No. 6,226,611; hereinafter Neumeyer).

1. Regarding claim 3, the examiner cites Neumeyer et al., as existing art.

A. The examiner states that in "Col.10, lines 30-45 Neumeyer et al, teach or discuss a plurality, or sets of HMMs, i.e., a network."

Response: In order to understand the novelty of applicant's patent application, we must make a distinction between the definitions of "a plurality of HMMs" and "sets of HMMs". A plurality of HMMs is a number of HMMs that model the constituent sounds in a language, such as the plurality of phonetic models in Neumeyer, et al. In applicant's present application, sets of HMMs are made up of several pluralities of HMMs, specific to a particular "environment". The "environment" may include that of speaker type, such as male, female, or child, or of various other means of determining an "environment" such as dialect types, accent types, etc. Taking as one example embodiment of applicant's invention the "environments" of male and female, then in applicant's present invention we would have two pluralities of HMMs, a plurality of HMMs modeling the constituent phonetic sounds in a language as spoken by males, and a plurality of HMMs modeling constituent phonetic sounds in a language as spoken by females. Nowhere in Neumeyer is there made a distinction of sets of HMMs by "environment".

It must also further be understood that a plurality of HMMs or even sets of HMMs do not in and of themselves form a "network". In the speech recognition art, one defines a "network" as a structure that defines the allowable sequence of HMMs that can be recognized. Sometimes, as in Neumeyer et al., the "network" may also be viewed as the allowable sequence of HMMs that can be recognized including the structure of the

HMMs themselves, as in Col.10, lines 37-40. In this discussion we use the prior definition.

B. The examiner states that, "Col 10, line 53 - Col. 11, line 54, Figure 4, of Neumeyer et al., shows sets of HMMs performing multiple duration calculations, therefore multiple sets, to find the correct acceptable path, especially in a sentence grammar structure, Col 1, lines 37-44" (Note: I think the last reference is incorrect. I think the examiner means Col.10, lines 37-44.)

Response: In Neumeyer et al., by "duration calculations" is meant the determination of how many input frames mapped to each word, HMM, and state. This clearly does not imply multiple sets of pluralities of HMMs in which the sets are specific to a particular "environment". Therefore, the statement that "multiple duration calculations" implies multiple HMM sets where each set is specific to a particular "environment" is erroneous. As a further evidence that Neumeyer et al. does not consider multiple HMM sets as defined in (A) above, Figure 4 shows the mapping of durations to words, phones (HMMs) and phone (HMM) states, but none of the words, phones, or states has any notation of belonging to a particular HMM set, such as male or female. To the contrary, the words (such as "she"), the phonetic HMMs (such as "SH") and the phonetic HMM states (such as STATE:1) have no particular HMM "environment" notation which is critical to applicant's invention.

It should be noted that applicant's invention describes a method of creating a compact "network"-- which is independent of the number of HMM sets-- that allows recognition results to be determined based on acceptable paths that only use models from a particular HMM set. For example, in the example embodiment of applicant's invention mentioned above in (A), an acceptable path must and will contain only models from the female HMM set, or must and will only contain models from the male HMM set. Nowhere in Neumeyer et al., is any compact network described, or any concept of sets of HMMs based on particular "environments" mentioned.

Claim 3 is therefore deemed allowable.

2. Regarding claim 5, the examiner cites Neumeyer et al., as existing art.

A. The examiner states that "Col. 10, line 53 - Col. 11, line 51, Figure 4, of Neumeyer et al., shows sets of HMMs performing multiple duration calculations, therefore multiple sets, to find the correct acceptable path, especially in a sentence grammar structure, Col. 1, lines 37-44." (Note: I think the last reference is incorrect. I think the examiner means Col.10, lines 37-44.)

Response: The objection by the patent examiner is the same as that for claim 3. Please see 1.B above for a response. Claim 5 is therefore deemed allowable

3. Regarding claim 7, the examiner cites Neumeyer et al., as existing art.

A. The examiner states that "Neumeyer et al., teach the method of claim 5, wherein said building step includes for each frame path propagation expansion based on the grammar network and update-observation-probability (Col. 10, line 53 - Col. 11, line 51, Figure 4)."

Response: Any HMM recognizer using Viterbi decoding will do path propagation expansion and update to include observation probabilities. The examiner is correct that Neumeyer includes this. However, claim 5 of applicant's invention is much more than this. Claim 5 states that the propagation expansion expands the propagation of acceptable paths by using a generic base recognition network which is independent of number of HMM "environment" sets, and utilizing the methods of applicant's invention to expand each acceptable path by its particular HMM set only by using applicant's invented conversion function methods. Claim 5 is therefore deemed allowable.

Claim 7 is amended to make this more descriptive as follows:

The method of Claim 5 wherein said building step includes for each frame path propagation expansion *within each expanded HMM set* based on the grammar network and update-observation-probability."

4. Regarding claim 8, the examiner cites Neumeyer et al., as existing art.

A. The examiner states that "per claim 8, Neumeyer et al., teach the method of claim 7..." in Col. 11, lines 10-18.

Response: In this paragraph the examiner is stating that Neumeyer et al., teach applicant's claim 7, and further claim 8. Claim 8 states specifically that path propagation extends "...a Viterbi search for each expanded symbol for each HMM set individually and

separately." By this is meant that each HMM set will only have path propagation occur within models of that same HMM set. In applicant's example embodiment, a path that involves only the set of a plurality of male HMM models will only be extended using models from the set of a plurality of male HMM models, and the set of a plurality of female HMM models will only be extended using models from the set of a plurality of female HMM models. This is done using a network that is independent of number of HMM sets representing different "environments". In Neumeyer et al., Col. 11, lines 10-18 there is no mention of expanding paths using different HMM sets and expanding the paths individually and separately, nor is there any way to infer this.

5. Regarding claim 12, the examiner cites Neumeyer et al., as existing art.

A. The examiner states "(Col 10, lines 30-45, Neumeyer et al., teach or discuss a plurality, or sets of HMMs, i.e., a network. Col. 10 line 53 - Col. 11, line 54, Figure 4, of Neumeyer et al., shows sets of HMMs performing multiple duration calculations, therefore multiple sets, to find the correct acceptable path, especially in a sentence grammar structure, Col. 1, lines 37-44)."

Response: First, this argument is similar to that discussed in 1.A and 1.B above. See the above response in these sections for a response. Neumeyer et al., nowhere discuss or disclose the use of a generic base grammar (a grammar network which is independent of the number of HMM set "environments") and the expansion of base-symbols (symbols which are independent of "environment") to construct recognition paths defined on expanded symbols (symbols which are "environment" dependent) by mapping functions as taught in applicant's invention.

6. Regarding claim 13, the examiner cites Neumeyer et al., as existing art.

A. The examiner cites "(Col. 10, line 53 - Col. 11, line 51, Figure 4)."

Response: Please see above response to 1.B. Neumeyer et al., nowhere teach or disclose constraining recognition paths to expanded symbols within one model set (a model set corresponding to one "environment"). Neumeyer et al. do not even mention other "environments" and specifically do not constrain recognition paths to paths within models corresponding to the same "environment".

7. Regarding claim 14, the examiner cites Neumeyer et al., as existing art.

A. The examiner states that Neumeyer et al., claim HMM models.

Response: Claim 14 is dependent on claim 12 and is deemed allowable for at least the same reasons as claim 12.

8. Regarding claim 15, the examiner cites Neumeyer et al., as existing art.

A. The examiner states that "Neumeyer et al., teach the recognizer wherein the models of each set correspond to a single environmental factor (Col.10, line 53 - Col. 11, line 51, Figure 4)."

Response: See the above response to 1.B. It is clear that Neumeyer et al., do not teach model sets corresponding to single environmental factors. Nowhere in Neumeyer et al. do they mention any "environment" that should be used to separate acceptable recognition paths, such as female, male, child, dialect, accent, etc. Since they do not mention separate model sets corresponding to such "environments", then clearly they do not teach or disclose any method to constrain recognition to such paths.

9. Regarding claim 16, the examiner cites Neumeyer et al., as existing art.

A. The examiner states that Neumeyer et al., teach a recognition path construction procedure and an update observation probability procedure.

Response: Claim 16 is dependent on claim 12 and is therefore deemed allowable for at least the same reasons as claim 12.

10. Regarding claim 6, the examiner cites Naylor et al., as existing art.

A. The examiner states that claim 6 is anticipated by Naylor et al.

Response: Each step in claim 6 is addressed.

The examiner states that "(Col. 3, lines 30-40, Fig. 2, items 32, 34, 36) anticipate a generic network containing base symbols." In applicant's patent application the generic network is a grammar network defining the allowable sequence of generic (environment independent) base symbols. The text cited does not mention any grammar network. In Naylor et al., Fig. 2, item 32, is a prototype HMM model which has nothing to do with a grammar network, item 34 is a method of generating acoustic speech features which has nothing to do with a grammar network, and item 36 is a labeling of training data for use in training HMM models which also has nothing to do with a grammar network.

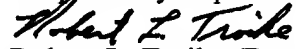
The examiner states that Naylor teaches a plurality of sets of HMMs such as male and female "(Col. 6, lines 15-25)". It does not so state. Even if one may infer multiple HMM sets based on different "environments", applicant's patent application is not just disclosing HMM recognition using multiple HMM sets. Applicant teaches to perform recognition, constraining the acceptable paths to each HMM set, while only using a grammar network which is independent of the type and number of HMM sets. The examiner states that Naylor et al., Fig. 4 anticipates "each said set of HMMs enumerated in terms of expanded symbols which map to the generic network base symbols". Figure 4 nowhere teaches or discloses "said set of HMMs enumerated in terms of expanded symbols which map to the generic network base symbols." In Naylor et al., Col. 8, line 23 though Col. 9 line 50, there is no mention of generic network base symbols being expanded to expanded symbols of multiple HMM sets, and no item in Figure 4 mentions this step.

The examiner states that Naylor et al., " Figs 5-7, Col. 8 , lines 45-52, Col. 7 lines 49-55)" anticipate "accessing said generic network using said base symbols through a conversion function that gives base symbols for expanded symbols to therefore decode multiple HMM sets using a generic base sentence grammar and using said HMM sets to recognize incoming speech". Nowhere in the cited figures is there any step that accesses a generic network and uses a conversion function between base symbols and expanded symbols corresponding to multiple HMM sets in order to determine the set of symbols for expansion. Fig. 5 item 80 clearly indicates only one set of nodes (symbols) is being used for expansion "the set of nodes which can feed forward to node n". Hence, Naylor et al. do not mention a generic network being expanded into multiple environment-dependent HMM sets, but rather either include all HMMs within a single environment-dependent network, or they use a single set of environment-independent HMMs.

In view of the above applicant's Claims 3, 5, 6, 7(amended herein), 8, and 10(amended herein), 11(amended herein), 12-16, 17(amended herein), and 18-19 are deemed allowable and an early notice of allowance of these claims is deemed in order and is respectfully requested.

If the examiner persists in the rejection the applicant respectfully requests the amendments be entered for purposes of appeal. The Commissioner for Patents is hereby authorized to charge the costs or any other fees including fees for the extra claims which may be required to Deposit Account No. 20-0668 of Texas Instruments Incorporated.

Respectfully requested;



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